

REMARKS

Applicants wish to thank Examiners Tran and Swerdlo for taking the time to conduct the telephone interview on April 8, 2004 with the Applicants' undersigned representative in connection with this application.

In the office action, claims 1 - 3, 8 - 10, 11 - 13 and 20 were objected to; claims 1 - 9 and 11 - 20 were rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,528,630 (to Ashley); and claim 10 was rejected under 35 U.S.C. § 103(a) over Ashley in view of U.S. Patent No. 6,028,487 (to Kakuta et al.). Responsive to the office action, claims 1, 4, 7 and 8 are amended, and claims 9 - 10, 12 - 15 and 17 - 18 are cancelled.

As stated in the present application:

The receive signal appearing on the matching impedance is bootstrapped through multiple feedbacks to create a much larger termination impedance on the line.

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The impedance seen by the primaries during receiving, therefore, is not simply the matching impedance, but is the matching impedance multiplied by a gain that is provided by the dual negative feedback network.

As further explained in the application:

The dual negative feedback network of the transmission path boosts the small impedance of the matching network (ZM) to a much larger line driver output impedance to match the characteristic impedance of the transmission line. Matched termination of the line improves transmission efficiency for the received signal. While the matching impedance manifests itself significantly larger to the receive signal, it appears with its actual value for the transmit signal. As a result, by using a small matching impedance, only a small fraction of the total power is consumed by the matching impedance and an efficient operation is achieved.

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The dual negative feedback network, therefore, provides that a relatively small matching impedance may be used (which saves power) while still providing matched termination of the line for the received signal.

The Ashley reference discloses a coupler for use with a transceiver in a multi-frequency communication system. The coupler includes a pair of primary transformer windings (303) and an impedance circuit (313) between the two primary windings (303). The impedance seen by the primaries (303) is the matching impedance that is provided by the impedance circuit (313).

The Ashley reference does not disclose the use of an impedance seen by the primaries that is the matching impedance multiplied by a gain factor as provided by the applicant's disclosed circuits. The structure by which the applicants have achieved this function is the dual negative feedback network. The Ashley reference further does not disclose any such dual negative feedback. The office action asserts that a first negative feedback path is disclosed in Ashley from first sides (306, 307) of each primary winding to the inputs of a transmission amplifier, and that a second negative feedback path is disclosed in Ashley from second sides (310, 311) of second sides of each primary winding to the inputs of the transmission amplifier. Applicants respectfully disagree. In the circuit shown in Figure 3 of Ashley the first sides of each primary winding are indeed coupled to the transmitter amplifiers, but the second sides of each primary winding are not coupled to the transmitter amplifiers. Rather the second sides of each primary winding are coupled to *receiver* amplifiers. There is, therefore, no *double* feedback in the circuit of Ashley.

The office action further states that it would have been obvious at the time of the invention to combine the teachings of Ashely with the teachings of Kakuta et al. to arrive at the subject matter of former claim 10 (now cancelled).

The Kakuta et al. reference discloses a negative feedback amplifier for independently controlling gain and impedance that includes a plurality of FET transistors that are coupled to one another in cascode connection. A drain of the final stage FET (12) is coupled to a gate of the first stage FET (11) through a first negative-feedback circuit (13), and a drain of the first stage FET (11) is coupled to the gate of the first stage FET (11) through a second negative-feedback circuit (14). The Kakuta et al. reference further discloses that:

In the above mentioned negative-feedback amplifier circuit, an output impedance can be adjusted by the first resistor R_{f1} . A gain can be adjusted by the first and the second resistors R_{f1} and R_{f2} . Therefore, by adjusting the gain and the output impedance by the resistors R_{f2} and R_{f1} , respectively, the gain and the output impedance can be independently controlled.

Kakuta et al., col. 3, lines 24 – 27.

The impedance in Kakuta et al., however, is the impedance at the OUT node with respect to ground. Any combination of the teachings of Kakuta et al. with the disclosure of Ashley might, at best, result in the negative feedback amplifier circuit of Kakuta et al. being used for the transmitter amplifiers in Ashley wherein the OUT node of Kakuta et al. would drive the nodes (306) and (307) of the primaries (303). There is no teaching or suggestion in Kakuta et al. of using the nodes on either side of the transistor (12) in Figure 2 of Kakuta et al. to drive either side of a first primary winding. It is inappropriate to modify the disclosure of either Ashley or Kakuta et al. to arrive at the subject matter of the invention without some teaching or suggestion to do so. The fact that Kakuta et al. discloses that the impedance (at the OUT node) and the gain (at the OUT node) may be varied independently provides no such teaching, suggestion or even motivation.

Neither the Ashley reference nor the Kakuta et al. reference nor any combination

thereof, teaches, discloses or suggests all of the elements of claim 1 as amended herein.

Dependent claims 2, 3 and 11 depend from claim 1 and further limit the subject matter of claim 1. Each of claims 1 - 3 and 11 is submitted, therefore, to be in condition for allowance.

Each of independent claims 4, 7 and 8 (as amended herein) also includes the above requirements of two negative feedback paths as discussed above with reference to amended claim 1. Each of these claims, as well as each of dependent claims 5, 6, 16, 19 and 20, is therefore considered to be in condition for allowance.

Applicant submits, therefore, that each of claims 1 - 8, 11, 16, 19 and 20 is each in condition for allowance. Favorable action consistent with the above is respectfully requested.

Respectfully submitted,



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